

STATE OF CALIFORNIA  
DEPARTMENT OF CONSUMER AFFAIRS  
BUREAU OF HOME FURNISHINGS  
NORTH HIGHLANDS, CALIFORNIA

TECHNICAL BULLETIN 106

FEDERAL STANDARD 16 CFR 1632 (FF 4-72)

CALIFORNIA ADMINISTRATIVE CODE TITLE 4, CHAPTER 3, SECTION 1371

Requirements, Test Procedures and Apparatus for Testing the  
Resistance of a Mattress or Mattress Pad to Combustion Which  
May Result from A Smoldering Cigarette.

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### Requirements, Test Procedures and Apparatus for Testing the Resistance of a Mattress or Mattress Pad to Combustion Which May Result from a Smoldering Cigarette

#### I. Mattresses and Mattress Pads - Requirements

1. A mattress or mattress pad fails to meet the provisions of law if any of the following conditions occur:
  - (a) If obvious flaming combustion occurs.
  - (b) If flameless combustion (smoldering) continues for more than five minutes after the cigarette has extinguished.
  - (c) If a char develops more than two inches in any direction from the cigarette, including laterally or downward into the mattress or pad, measured from its nearest point.
2. Flame retardant properties shall be retained by the mattress under all normal conditions of temperature, humidity and use and shall be able to meet the test requirements of these regulations at any time during their useful life.
3. Flame retardant treatments shall not be lost due to migration, sublimation, abrasion, dusting off, wetting or any other process, so that the effectiveness of the treatment is progressively lost.
4. Flame retardant treatments shall not, under combustion conditions significantly add to the amount of noxious smoke and/or toxic gases normally produced by untreated filling materials.

#### II. Test Materials

1. Cigarettes. Cigarettes shall be made from natural tobacco and shall be  $85 \pm 2$  mm long with a diameter of  $0.3 \pm 0.02$  inches and a weight of  $1.1 \text{ gms} \pm 0.1 \text{ gms}$  and shall attain an ember temperature of not less than  $1,000^\circ \text{F}$ . "Ember temperature" means the temperature at which the lighted portion of a cigarette burns. Filter tip cigarettes shall not be used.
2. Sheets. The sheets shall be white, 100 percent combed cotton percale, not treated with a chemical finish which imparts a characteristic such as permanent press or flame resistance, with 170 - 200 threads per square inch and a fabric weight of  $115 \pm 14 \text{ gms/sq m}$  ( $3.4 \pm 0.4 \text{ oz/sq yd}$ ). Size of sheet shall be appropriate for the mattress being tested.
3. Mattress or Pad. The mattress or pad tested shall be the finished product ready for sale to the consumer.
4. Fiberglass Board Substrate. When thin flexible mattresses and mattress pads are tested, they must be placed over a fiberglass board having the following characteristics: 1" thickness, thermal conductivity of  $0.30 \pm 0.05 \text{ cal (g)/hr cm}^2 \text{ }^\circ\text{C/cm}$  at  $23.9^\circ\text{C}$  ( $75^\circ\text{F}$ ).

#### III. Preparation of Test Materials

1. Mattress or mattress pad, sheets and cigarettes shall be conditioned at a temperature of  $65^\circ\text{F}$  or greater and a relative humidity of less than 55% for 48 hours prior to test. Mattress shall be so positioned so as to allow for maximum surface exposure to conditioning environment.
2. Sheets. The sheets shall be laundered once before use in an automatic home washer using the hot water setting and longest normal cycle with the manufacturer's recommended quantity of a commercial detergent, and dried in an automatic home tumble dryer. The sheet shall be cut across the width into two equal parts after washing.
3. Mattresses and mattress pads. The mattress or pad shall be divided laterally in two sections, one section for the bare mattress or pad test and the other for the two-sheet test.

#### IV. General Requirements

1. The mattress or pad shall be tested under conditions of at least  $65^\circ\text{F}$  temperature or greater and at less than 55% relative humidity.
2. The test shall be performed in such a manner that each differently dyed area of the mattress or pad tick is included in the test locations.
3. If a cigarette self-extinguishes before burning its full length or rolls off a test location or pops out of position when tested on a tuft, the test is considered "no test" and must be repeated with a freshly lit cigarette on a different portion of the same type of location on the mattress or pad.
4. Location of the test cigarettes on the mattress or pad shall be no less than 6 inches apart.
5. All sleeping surfaces of the mattress or pad shall be tested.

#### V. Bare Mattress Test

1. Smooth surface. Three burning cigarettes (well lighted but not burned more than 4 mm (0.16 inch)) shall be placed directly on a smooth surface location on the test mattress on the half reserved for bare mattress tests. The cigarettes should burn their full lengths on a smooth surface without burning across a tuft or stitching of a quilted area. However, if this is not possible because of mattress design, then the cigarettes shall be positioned on the mattress in a manner which will allow as much of the butt ends as possible to burn on smooth surfaces.
2. Tape edge. Three burning cigarettes shall be placed in the depression between the mattress top surface and the tape edge, parallel to the tape edge on the half of the test mattress reserved for bare mattress tests. If there is no depression at the edge, hold the cigarettes in place along the edge and parallel to the edge with straight pins. Three straight pins may be inserted through the edge at a  $45^\circ$  angle such that one pin supports the cigarette at the top, one at the center, and one at the butt. The heads of the pins must be below the upper surface of the cigarette.

3. Quilted location. Three burning cigarettes shall be placed on quilted locations of the test mattress. The cigarettes shall be positioned directly over the thread in the depression created by the quilting process on the half of the test mattress reserved for bare mattress tests. If the quilt design is such that the cigarettes cannot burn their full lengths over the thread, then the cigarettes shall be positioned in a manner which will allow as much of the butt ends as possible to burn on the thread.
4. Tufted location. Three burning cigarettes shall be placed on tufted locations of the test mattress. The cigarettes shall be positioned so that they burn down into the depression caused by the tufts and so that the butt ends of the cigarettes burn out over the buttons or laces used in the tufts on the half of the mattress reserved for bare mattress tests.

#### VI. Two-sheet Tests

Spread a section of sheet material smoothly over the mattress surface and tuck under the mattress on the second half of the test mattress, which has been reserved for the two-sheet test.

1. Smooth surfaces. Three burning cigarettes shall be placed directly on the sheet-covered mattress on a smooth surface location as defined in the bare mattress test. Immediately cover the first sheet and the burning cigarettes loosely with a second, or top sheet. Do not raise or lift the top sheet during testing unless obvious ignition has occurred. If ignition occurs, immediately remove the sheets and cigarette.
2. Tape edge. Three burning cigarettes shall be placed in a depression between the top surface and the tape edge on top of the sheet, and immediately covered with a second sheet. In most cases, the cigarettes will remain in place throughout the test; however, if the cigarettes show a marked tendency to roll off the tape edge location, they may be supported with straight pins. Three straight pins may be inserted through the bottom sheet and tape at a 45° angle such that one pin supports the cigarette at the top, one at the center, and one at the butt. The heads of the pins must be below the upper surface of the cigarette.
3. Quilted locations. Three burning cigarettes shall be placed in a depression caused by quilting, directly over the thread and on the bottom sheet, and immediately covered with the top sheet. If necessary, a thin rod may be used to depress the bottom sheet into a depression. If the quilt design is such that the cigarettes cannot burn their full lengths over the thread, then the cigarettes shall be positioned in a manner which will allow as much of the butt ends as possible to burn on the thread.
4. Tufted locations. Three burning cigarettes shall be placed in the depression caused by tufting, directly over the tuft and on the bottom sheet, and immediately covered with the top sheet. If necessary, a thin rod may be used to depress the bottom sheet into a depression. The cigarettes shall be positioned so that they burn down into the

depression caused by the tuft and so that the butt ends of the cigarettes burn out over the buttons or laces used in the tufts.

NOTE: At least 18 cigarettes shall be burned on each mattress test surface, nine in the bare tests and nine in the two-sheet tests. If three or more types of mattress surface locations (smooth surface, tape edge, quilted or tufted areas) exist, three cigarettes should be burned at each different location. If only two types of locations exist (smooth surface and tape edge) exist, four cigarettes should be burned on the smooth surface and five cigarettes on the tape edge.

#### VII. Mattress Pad Test Requirements

All mattress pads are tested as in Section V and Section VI with the following exceptions.

1. Mattress pads are not tested on the bottom surface, only on the top surface. One half of the pad is tested bare and the other half with two sheets. At least 18 cigarettes should be used as specified above in "Note," Section VI.
2. Mattress pads are tested after placing the pad over an inert fiberglass board substrate 1" thick with specifications as in Section II, 4. If mattress pad contains elastic corner bands or scrim netting, this is placed under the board so that the surfaces of the pad are flat and smooth, and contact the board surface. Use of the board ensures uniformity of the underlying surface from lab to lab, and eliminates variations in smolder performance due to heat transfer.
3. Mattress pads containing a chemical fire retardant should be washed and dried ten times before testing, unless they are intended for one time use only, or are not intended to be laundered. To wash the pads, AATCC Test Method 124-82 should be followed, using a water temperature during washing of  $60^{\circ} \pm 2.8^{\circ}\text{C}$  ( $140 \pm 5^{\circ}\text{F}$ ) and the drying procedure described therein. Maximum load should be 3.46 kg (8 lbs) consisting of any combination of test pads and dummy pieces. A variation in this wash procedure is allowed if found to be equivalent. Mattress pads labeled "Dry Clean Only" should be dry cleaned before testing by a procedure previously found acceptable.

#### TICKING SUBSTITUTION PROCEDURE

##### I. Equipment Required:

1. Test mounting box: 6" deep, 12" square, constructed of plywood, with 1/2" diameter holes on 2 opposite sides. (see Figure 1)
2. Sheeting material (12" x 12" square) (laundered).
3. Template, designed to allow a 1 inch marking around placement of the cigarettes (use of template optional).
4. Stapler and/or masking tape (to attach ticking to box).
5. Blended cotton felt, all new material, thoroughly garnetted, consisting of not less than 67% linters

and not more than 33% picker or equivalent and having not more than 5% non-cellulosic total content. Cotton shall contain no bleach or fire-retardant.

6. Polyurethane foam, density 1.2 to 1.5 p.c.f. , I.L.D. - 22 to 35 lbs, each test specimen measuring no less than 12" x 12" x 1/4" ( $\pm 1/32$ ") thick. Foam shall contain no fire-retardant.

## II. Test Procedure:

1. All materials (test specimens, cigarettes, laundered sheets, foam and felt) shall be conditioned in air at a temperature greater than 18°C, and an R.H. less than 55% for 48 hours prior to testing.
2. Place  $907.2 \pm 4$  grams (2 lbs) of cotton felt in test box, allowing felt to extend above top of box up to 3 inches.
3. Place one 12" square specimen of urethane foam over the cotton felt.
4. Stretch the ticking specimen (no less than 20" square) over the foam pad and fasten ticking to sides of box with stapler or tape. Avoid wrinkles in fabric and stretch fabric tight enough to ensure contact with substrate material, (no air gaps).
5. Testing should be performed in a test room maintained at the same temperature and relative humidity conditions specified in step (1) for conditioning.
6. Three representative specimens of ticking should be tested of each type, with three cigarettes burned on each specimen. No more than one cigarette should be burned at any time per specimen. At least one cigarette should be tested on the most prominent design and color area to determine dye effects on burning. If quilted areas are present, one cigarette should be tested on the thread or in the quilting depression. Each cigarette should be placed at least 2" from box edges and from other cigarettes.
7. Light and place one cigarette on the ticking and cover with a 12" square of sheeting. Cigarette tip shall not be burned more than 4 mm when lit. Three straight pins at middle and ends of cigarette may be used for support but pinheads must be below upper surface of cigarette. Repeat burn test with a second and third cigarette in appropriate areas.
8. After completion of 3 burns per specimen, remove all char or discoloration from cotton felt and replace charred area with new cotton until a weight of 2 lbs of cotton is reached.
9. If a cigarette self-extinguishes before burning its full length, repeat the test with a new cigarette on different parts of the ticking until three cigarettes have burned or three cigarettes have self-extinguished.
10. The maximum char lengths of all cigarettes should be accurately measured and recorded before removal of cigarette, using template if necessary.

The following criteria are applied, for any ticking specimen:

Pass = Char length less than 1" in any direction from cigarette and felt not ignited, for all three cigarettes.

Fail = Obvious ignition of one or more cigarettes or char length exceeds 1" at any point for one or more cigarettes.

11. If all three cigarette test locations meet the above test criteria, repeat the test procedure outlined above with new ticking specimens directly over the cotton pad (without 1/4" thick urethane foam layer). Measure char lengths as above and record. Charred cotton should again be replaced before testing.

12. The ticking is classified by the following criteria:

Class A: Three ticking specimens pass the cigarette criteria directly over cotton felt. (Total of nine cigarettes burned over felt and foam and nine burned over felt only).

Class B: Three ticking specimens pass the cigarette criteria over 1/4" foam above felt. (Total of nine cigarettes burned).

Class C: One or more cigarettes fail criteria over foam covering cotton felt.

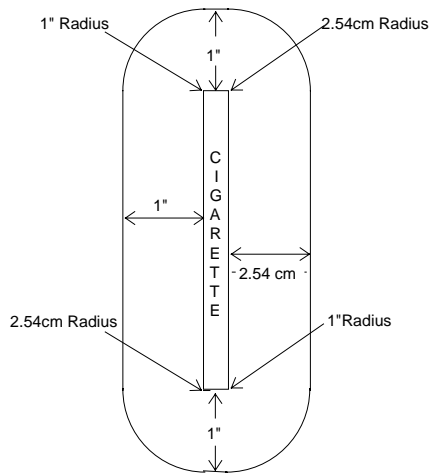
## TAPE EDGE SUBSTITUTION PROCEDURE

This test is designed to test the equivalent smoldering performance of tape edges in mattresses or pads when only the tape edge of the mattress is to be substituted.

### I. TEST PROCEDURE:

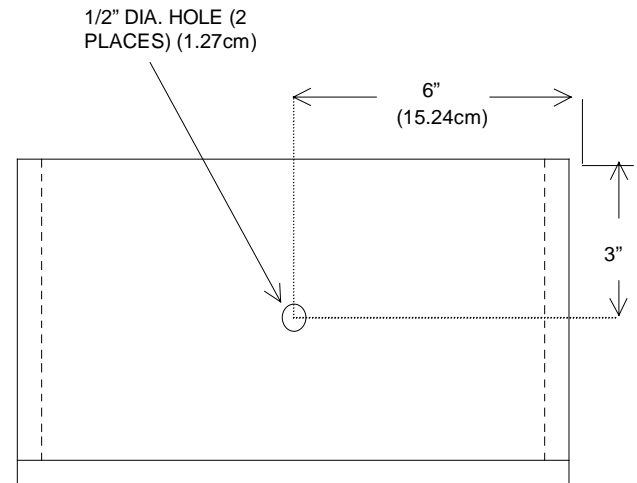
1. A prototype mattress or mattress pad is tested as in the procedure for mattresses and pads, outlined above.
2. Mattress tested should be same as earlier mattress tested except where tape edge construction material has been substituted.
3. 36 cigarettes (18 per side - nine bare and nine with two sheets) are tested at tape edge locations only.
4. The char length at each of the 36 locations is measured and recorded.
5. A criteria for failure of greater than 2 inches is applied.
6. For the tape edge substitution to be valid, no cigarette failures can occur at any of the 36 locations tested.

**Test Box**  
**Material 1/2" Plywood**  
**Tolerances +1/32" - 0"**

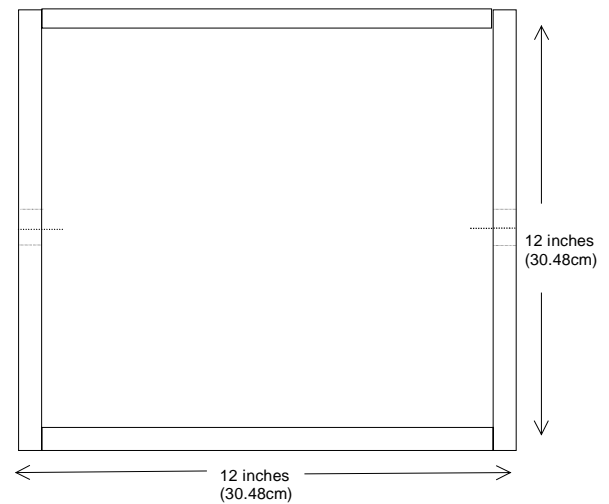


**1 INCH (2.54 cm) TEMPLATE**  
**TOLERANCES + 1/32" - 0"**

**Side View**



**Top View**



**3-dimensional View from Top**



CALIFORNIA BUREAU OF HOME FURNISHINGS AND THERMAL INSULATION

MATTRESS FLAMMABILITY LABELING

- (e) This label is true for all mattresses and may be attached to any mattress meeting requirements of 16 CFR 1632 (D.O.C. FF 4-72) (Federal Cigarette Resistance Standard). Voluntary label.

**NOTICE:**

**THIS MATTRESS IS DESIGNED  
TO RESIST COMBUSTION  
WHICH MAY RESULT FROM A  
SMOLDERING CIGARETTE.**

- (f) This label must be attached to any mattress sold in California which contains polyurethane foam not complying with the flammability requirements of Technical Bulletin 117 (must be CAPITALIZED, 1/8" high letters).

**NOTICE:**

**THIS PRODUCT CONTAINS  
NON-FLAME RETARDANT  
POLYURETHANE FOAM. AVOID  
CONTACT WITH OPEN FLAME.**

Note: Statements (e), (f) may be combined on one label if both apply.